FACT SHEET

UNITED STATES AIR FORCE

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ACTIVE DENIAL SYSTEM

Advanced Concept Technology Demonstration

What is It? The Active Denial System (ADS) is a non-lethal, counter-personnel directed energy weapon. It uses advanced technology to provide an unprecedented non-lethal capability with a range beyond that of small arms. ADS projects a focused beam of millimeter waves to induce an intolerable heating sensation on an adversary's skin, repelling the individual without causing injury. This capability will enable U.S. forces to stop, deter and turn back an advancing adversary without applying lethal force. ADS is designed to minimize fatalities, protect the innocent and limit collateral damage. It provides a means to stop individuals without resorting to deadly force. It provides a means of deterring individuals at a range greater than traditional arms.

Active Denial System
Advanced Concept Technology Demonstration System 1

The technology was originally developed by the Air Force Research Laboratory and matured under the sponsorship of the Department of Defense's Joint Non-Lethal Weapons Directorate. Approximately $51 million has been invested over the past eleven years. The technology can be used for protection of forces, peacekeeping, humanitarian missions and other situations in which the use of lethal force is undesirable. ADS will provide our warfighters an extraordinary new capability – a non-lethal system with a range greater than traditional small arms.

How Does It Work? Active Denial Technology produces millimeter waves at a frequency of 95 gigahertz and uses an antenna to direct a focused, invisible beam toward a designated subject. Traveling at the speed of light, the energy reaches the subject and penetrates the skin to a depth of less than 1/64 of an inch. It produces a heat sensation that within seconds becomes intolerable and forces the subject to instinctively flee. The sensation immediately ceases when the individual moves out of the beam or when the system's operator turns it off. The beam does not cause injury because of the shallow penetration depth of energy at this wavelength and the safety features designed into the system. The system is effective because it takes advantage of an innate instinctive response to escape harm.

Human Effects Testing A large portion of the investment, about $9 million, has been devoted to characterizing the effects of this technology on the human body. This effort was made to ensure the effects of millimeter waves are well understood and that a wide safety margin exists between levels that provide operationally useful effects and those that may cause injury. ADS has been the subject of an extensive test program that has been conducted in strict compliance with the procedures, laws and regulations governing animal and human research. The tests have been reviewed and approved by a formal Institutional Review Board with oversight from the Air Force Surgeon General's Office.

An independent panel of non-governmental science and medical experts also periodically reviewed and advised on the planning aspects and results of the research and test activities. A 2004 review of the program concluded there is low risk of serious injury from exposure to the ADS beam. Additionally, the panel concluded that the risk of thermal eye injury is low and that there was no evidence that millimeter wave energy causes cancer.

The Air Force Research Laboratory's Human Effectiveness Directorate at Brooks City-Base, Texas, conducted many years of successful and safe laboratory testing. In 2000, testing began at Kirtland Air Force Base, south of Albuquerque, New Mexico, using the new, full-scale Technology Hardware Demonstrator pictured herein. It enabled assessment of the potential military utility of the system.

System Evolution The Active Denial Technology Hardware Demonstrator represents the first integration of the key technology elements such as the millimeter wave source, cooling system, and antenna, among others. In 2001, it successfully demonstrated that the technology could achieve desired effects at distances beyond small-arms range and set the stage for the next evolution of the system. This next step is ongoing and involves the integration and packaging of all the system's components into a mobile, nearly militarized system. The configuration chosen is the High Mobility Multi-purpose Wheeled Vehicle, commonly referred to as a Humvee. This activity is being conducted under an Advanced Concept Technology Demonstration (ACTD) program, a DoD process to rapidly move mature technologies into the hands of the warfighter for military evaluation.

Active Denial Technology Hardware Demonstrator (ADS System 0)

Under the ACTD Program, the Air Force Research Laboratory has produced a Humvee-mounted prototype which began Military Utility Assessments (MUA) in August 2005. MUAs are formally evaluated assessments conducted by independent organizations that test the performance of the prototype in a variety of simulated operational scenarios. Depending on the results of this evaluation, a decision will be made regarding production and employment of the system. Since this is the first time this leading edge technology will be evaluated for military utility, it is possible that some of the Services will find they need different system configurations. These would include customization for specific missions and operating environments, such as on a ship or on an aircraft. Planning for an airborne system prototype has already begun under a separate effort. The employment of the ACTD Active Denial System has successfully completed legal and treaty compliance reviews.

Organizations Involved The ADS ACTD Program is being sponsored by the Office of the Deputy Under Secretary of Defense for Advanced Systems and Concepts, the Department of Defense Joint Non-Lethal Weapons Directorate and the U.S. Joint Forces Command. The Air Force Research Laboratory's Directed Energy Directorate at Kirtland Air Force Base, New Mexico, is the technical manager and responsible for the ADS prototype development. The Laboratory's Human Effectiveness Directorate at Brooks City-Base manages the human effects characterization research and test program. The Air Combat Command at Langley Air Force Base, Virginia, is the operational manager and is leading the military services in developing the concepts of operation and managing the formal military utility assessment. The Air Force's Electronic Systems Center at Hanscom Air Force Base, Massachusetts, is the transition manager charged with leading the planning activities necessary to transition the system into the formal Department of Defense acquisition process, should the decision be made to equip U.S. forces with ADS.

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